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STRATEGIC POSITION OF SCANDINAVIA: 1942

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SECRET
August 1, 1942

Office of Strategic Services

THE STRATEGIC POSITION OF SCANDINAVIA: 1942

I. Introduction

This report does not assess the advisability of Allied action in Scandinavia as opposed to action in other theaters; nor does it deal fully with the problems of terrain, opposition, and supply involved in Scandinavian operations. It attempts rather to present certain basic strategic characteristics of the Scandinavian area; to catalogue the present Order of Battle there; to describe the relevance of the present political situation in Norway, Sweden, and Finland to possible Allied action; and to indicate the economic stake of Germany in the region.

II. Basic Strategic Characteristics of Scandinavia

Norway may be divided, for strategic purposes, into two areas: the region from Narvik to Kirkenes; the area south of Trondheim. The intervening narrow coast presents such difficulties of terrain and communication that it would probably play a subsidiary part in military operations. The area south of Trondheim contains the major Norwegian cities, the bulk of the population, the railway net, and most of Norwegian industry. Control of the rail lines from Oslo to Trondheim and Bergen, in most instances, will guarantee dominance of the whole of Southern Norway. The German occupation of 1940 was based on this relationship of the cities to the rail lines.

The Northern region is sparsely settled, and lacks adequate overland means of communication, despite recent German efforts to expand and improve the road network. It is of importance

principally because it serves as a German base for operations against Northern Russia, and more particularly, against the Allied supply lines to Murmansk and Archangel which have carried more than 80% of Allied shipments to Russia.

It is probable that the German forces in the North have, for the most part, been supplied by sea. Assuming that sea routes to the North were to be denied to Germany, the principal means of supply available would consist of the railway, branching from Northern Sweden to Narvik, and the Arctic Highway, running north to Petsamo from the Finish railhead at Rovaniemi. Air transport to the North from Southern Norway and a motor road, broken by numerous ferries, are available; but they are inadequate as supply routes for sustained operations.

In Southern Norway Germany is in a position quickly to concentrate and enlarge its forces, without recourse to the Swedish railway system.

For strategic purposes the region of Petsamo-Kirkenes is unique in Scandinavia since it offers to the Allies the possibility of protection by land-based pursuit planes in any operations undertaken. It is about 65 miles from Murmansk to Petsamo; about 90 miles from Murmansk to Kirkenes. Narvik, some 400 miles from Murmansk, falls only within the range of medium and heavy bombers.

III. The Order of Battle in Scandinavia

Exclusive of the Kirkenes region German troops are believed to be distributed as follows throughout Norway as of August 1, 1942:

NORWAY	DIVISION
Alta	702nd
Narvik	199th
Mosjoen	196th
Trondheim	181st
Bergen	69th
Stavanger	214th
Oslo	710th
Poros	3rd Mt. A panzer force, possible a full division.

On the whole these divisions cannot be regarded as of first quality. At least two (199th and 214th) were withdrawn from the Eastern Front, and may not be at full strength.

In all 10-12 German divisions are believed to be in Northern Norway and Finland, of which five are stationed in the Petsamo region, and five further south, now concentrated for action at Salla. Perhaps two divisions are held in reserve near Ternio. A small tank unit and paratroops are reported massed with the ground forces at Salla. Some 10-21 divisions of German strength are thus concentrated in Southern Norway (six divisions) in the Kirkenes-Petsamo region (five divisions) and in north-central Finland (five divisions), with single divisions scattered in the intervening area (Mosjoen, Narvik, and Alta), and perhaps two in reserve in Finland. Offensive action is expected on the Salla front, and perhaps further north, towards Murmansk.

Germany has substantially expanded the air fields throughout Norway and northern Finland, and probably equipped them to handle larger forces than thus far have been located in the area. The major bases have been at Stavanger, Trondheim, Bardu, and in the Kirkenes-Petsamo region. As the following air order of battle indicates, the bulk of German striking power is now located in northern Norway and Finland, for operations against convoys to Russia, and the north Russian ports.

Luftwaffe

Strength and Disposition in Scandinavia, July 24, 1942

	Southern Norway	Trondheim Area	Northern Norway and Finland	Total
Long range bombers	33	39	120	192
Bomber reconnaissance	12	48	36	96
Dive bombers	--	--	78	78
Total bombers	(45)	(87)	(234)	(366)
Single-engine fighters	78	--	84	162
Twin-engine fighters	--	--	24	24
Total fighters	(78)	(--)	(108)	(186)
Army Cooperation	--	--	12	12
Coastal aircraft	34	--	68	102
Total aircraft	157	87	422	666
Percent of Total	24	13	63	100

Northern Norway and Finland - 5th air fleet.

Southern Norway - elements of 3rd air fleet.

The major German naval units now operating along the western coast of Norway are: (Narvik) the battleship Tirnitz, the pocket battleship Admiral Scheer, and the heavy cruiser Hipper; (Trondheim) the heavy cruiser Lützow and the light

cruiser Köln. They are believed to have a complement of at least eight destroyers.

The armed forces of Sweden include, at maximum mobilization, about 400,000 men. A lack of full equipment and divisional organization might lower Sweden's effective force somewhat below this level, in case of war. The artillery and tank equipment of Sweden are believed to have been substantially increased in the past two years. The Swedish Air Force is believed to total 367 planes, largely older types of German, Italian, British, and American craft. Sweden commands a considerable navy, although it lacks modern battleships.

IV. The Political Position of Scandinavia

A. Norway. A very high proportion of the Norwegian people is anti-German, and could be counted upon to assist any Allied action in the area. The Underground has accumulated some small arms and is propably prepared to conduct extensive sabotage. It would appear that the Norwegians are expecting an Allied invasion in 1942, and morale may suffer if no action is taken. The urgency of action with respect to Norway is increased by the mounting number of arrests there, designed to eliminate the leaders of Norwegian resistance, and by the critical food situation, which may precipitate prematurely a general revolt.

B. Sweden. Sweden's view of the war is complex, and her probable course of action cannot easily be predicted. The strongest single factor affecting Swedish opinion is the desire to maintain independence. Germany and Russia both are regarded as potential threats. Although Sweden has made limited concessions to Germany, not strictly compatible with her formal neutrality, assault by Germany, Russia, or the Allies would, almost without question, meet with full Swedish resistance. Sweden has shown a considerable sympathy both for Finland and for Norway, although popular support for Finland is less than in the first Russo-Finnish war. In general Sweden would prefer an Allied to an Axis victory in the war as a whole.

Three conditions, in all probability, must be not in order that Sweden fight with the Allies in any Scandinavian campaign:

1. The initial phases of the Allied action must be carried out with success, and without directly infringing on the borders of Sweden.

2. The expedition must be strictly Anglo-American, with no direct Russian assistance. It might be well, in fact, if it were accompanied by explicit Allied guarantees of Sweden's and, if possible, Finland's borders.

3. Aggression against Sweden must be initiated by the Germans. The degree and stubbornness of Swedish resistance will depend, in part, on the promptness and magnitude of Allied support, especially in aircraft, in which Sweden remains weak.

German need for Swedish transport facilities would be greatest in the case of an Allied attack on Narvik; it would be somewhat less should Allied action center in Southern Norway or in the Petsamo-Kirkenes area. In general Germany's military position in 1942 is such as to make undesirable any armed conflict with Sweden. It is therefore unlikely that Germany will make extreme diplomatic demands on Sweden unless the German position in Scandinavia were to be seriously threatened.

C. Finland. Finland is torn between a desire for peace and a desire to secure her borders against Russia. The length of the present campaign, the relative failure of German troops in Finland, and a difficult food situation have caused Finland virtually to suspend active military operations. A successful Anglo-American expedition to the Petsamo region might further shake Finnish resolution, especially if accompanied by Allied guarantees of Finland's borders and by the offer of food supplies. Germany's course, in these circumstances, is difficult to predict. It seems unlikely, however, that Finland alone is capable of forcing German troops from her territory.

V. Germany's Economic Stake in Scandinavia

The loss of Scandinavia as a whole would deprive Germany of important strategic resources on a scale sufficient to induce a substantial reduction in Germany military production. In addition to the 12 million tons of Swedish iron ore now going annually to Germany, important amounts of the following minerals are being drawn from the area: molybdenum, tungsten, nickel, copper, and aluminum. In addition Scandinavia furnishes the bulk of the German supply of timber, wood pulp, and cellulose; large quantities of fish and fish products; and about 25% of all the merchant ships now built in European yards. Finally, manufactured and semi-manufactured goods from Sweden effect important savings in scarce skilled labor. Germany, it is true, is required to export a considerable amount of coal and pig iron to Sweden, and some grain to Finland; but on the whole, the Scandinavian trade balance is heavily in her favor.

Northern Norway and Finland include three objectives of economic importance to Germany: the nickel mine and smelter at Petsamo, the relatively small Norwegian iron ore field at Sydvaranger, and the outlet at Narvik for Swedish iron ore. At present only small amounts of Swedish ore are shipped via Narvik, the bulk moving by sea (May-November) from Iulea, on the Gulf of Bothnia, to Luebeck and other North German ports.

VI. Conclusions

1. The principal objectives of an Allied campaign in Scandinavia, in order of their immediacy, would be:

(a) the protection of the Northern Supply route to Russia;

(b) the diversion of some element of the German armed strength;

(c) the denial of Scandinavian resources to Germany;

(d) the acquisition of important bases for further action against Germany.

2. The first objective might be accomplished by a campaign of limited liability based on Russian soil and directed against the Petsamo-Kirkenes district. Such a campaign would have the special advantage of protection by land-based pursuit planes; it would, however, require Russian acquiescence or collaboration.

3. The other objectives could probably not be achieved by a campaign of limited liability. They would require either the entrance of Sweden into the war as an ally, the use of a large number of Allied troops, or both. Swedish resistance would probably depend in large measure on the amount and promptness of Allied military assistance.

4. The delicate political situation in Sweden and Finland requires cautious handling on the part of the Allies. It is, nevertheless, believed that Sweden would defend itself rather than accede to a German demand for transit of troops and materiel to a theater of action in Norway or Finland in which Anglo-American forces were engaged. Germany's present military position, however, makes an extreme demand upon Sweden, by Germany, unlikely.

5. 5. In general it should be emphasized that the political situation in Scandinavia is such as to make difficult a strictly limited operation.

The possibility of extended liabilities and opportunities should enter into the planning of any Scandinavian operation and into the weighing of Scandinavian action as against action in other possible theaters.

SCANDINAVIA AND THE GERMAN WAR ECONOMY

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Scandinavia and the German War Economy

SUMMARY AND CONCLUSIONS

1. The mineral and timber resources, manufacturing facilities, and, to some extent, foodstuffs of Scandinavia are now being exported on a large scale to Germany. Although, in return, Germany is forced to send some commodities to the area, notably coal and pig iron to Sweden and foodstuffs to Finland, the balance is heavily in her favor.

2. As a rough approximation, the following table, giving the estimated proportion of European Axis mineral production coming from Scandinavia measures the relative importance of Norwegian, Swedish and Finnish minerals to the German war economy.

	Estimated Percentage of Total European Axis Supply from Scandinavia 1942.
Iron Ore (M.C.)	19%
Pyrites (ore)	38%
Molybdenum (M.C.)	73%
Tungsten (60% WO_3)	6%
Nickel (M.C.)	78%
Copper (M.C.)	39%
Aluminum	5-10%
Zinc (M.C.)	9%

In the case of pyrites and aluminum alternative sources could be developed within the Axis economy, should Scandinavia be denied to Germany, although this process would require time and the expenditure of scarce capital, equipment and labor. The same is true, essentially, of Swedish iron ore, although the qualitative loss here would be especially difficult to compensate for. With respect to molybdenum, tungsten, nickel copper and to a lesser extent zinc, all Axis sources are being fully used; and serious consequences would follow from the loss to Germany of these sources.

Copper and the steel-hardening alloys are among the materials most seriously short in the German war industries.

3. Scandinavia is the major source of German imports of timber, wood pulp, and paper. The loss of these imports would be seriously felt, especially cellulose, which is used in the manufacture of substitute textiles and fodder, as well as in explosives.

4. Scandinavian foodstuffs, notably fish, milk, pork, and butter, are an extremely useful, but not indispensable German source. Of these, large Norwegian exports of fish and fish products are of the greatest importance.

5. In 1941 it is estimated that Scandinavian ship-yards produced some 185,000 tons of merchant shipping, or 26% of the total produced in Axis yards. At present both Norwegian and Swedish facilities are employed on German account. The loss of the well-organized and well-manned Scandinavian shipyards would be serious, despite the availability of other facilities elsewhere on the Continent.

6. The considerable exports of manufactured goods, especially from Sweden, are of appreciable importance to Germany in that they involve considerable savings in skilled labor, in which the Axis economy is notably short.

7. The economic consequences of the denial of Scandinavia to Germany are of a character such as to involve both an immediate and a long-run diminution in war production. In monetary terms the net contribution of Scandinavia to the German national income is relatively small but the strategic quality of the materials flowing to Germany makes the area of major importance to Axis military production.

SCANDINAVIA AND THE GERMAN WAR ECONOMY

1. Introduction

Germany's invasion of Norway was determined not only by a desire to deny to the Allies a flank against Europe, but also by the need to secure the output of Sweden's iron ore under conditions that would insure a minimum interruption of ore production, and maintain a subsequent continuous high level of output. Allied intervention, or a protracted campaign in which Sweden might have become directly involved, would have diminished the value of Germany's major economic price in Scandinavia. Germany's success, on the other hand, appreciably strengthened her whole war economy and gave her a very considerable stake in preserving the status quo in Scandinavia. As the following analysis indicates, that stake is reenforced by substantial subsidiary economic benefits now derived from Germany's dominant position in the region.

II. Scandinavian Mineral Production

The accompanying table indicates the minerals available in Norway, Sweden, and Finland which are both of strategic importance and present in quantities sufficiently large to be significant: iron, pyrites, molybdenum, tungsten, nickel, copper, and aluminum.

1. Iron Ore. Swedish iron ores are of high metal content[1] and contain, on the whole, considerable less sulphur than most of the ore types available on the Continent. Their conversion to steel thus requires less coke and less manganese,

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1. Swedish ores average 55- 68% metal content, as opposed, for example, to 30-40% for French ores. 60% metal content represents the rough over-all average for Swedish ores.

Scandinavian Contribution of Strategic Materials to European Axis - 1942

in 1000 Metric Tons

	1938	Est. 1942	% of Axis Europe 1942 Supply
Iron Ore (M.C.)			
Norway	972	600	2%
Sweden	8,411	5,700	17%
Pyrites (ore)			
Norway	1,028	1040	29%
Sweden	186.4	200	6%
Finland	103.0	100	3%
Molybdenum (M.C.)			
Norway	462	2,000	54%
Finland		700	19%
Tungsten (60% WO_3)		(1941 figures)	
Norway	19	20	1%
Sweden	180	200	5%
Nickel (M.C.)			
Norway	1.2	1.5	14%
Finland		7.	64%
Copper Ore (M.C.)			
Norway	21	25	16%
Sweden	7	15	10%
Finland	14	20	13%
Aluminum	(1940)		
Norway	15,000	20,000	5%
Zinc ore (M.C.)			
Norway	8	6	1.5%
Sweden	35	30	7.5%
Finland	1	1	.3%

effecting important savings. Although coal is abundant in Germany, coking facilities are somewhat strained; while the soundness of the German manganese position hinges, in considerable part, on her ability to rehabilitate the Krivoi Rog mines and transport their output.

The high phosphorus content of the ores from the fields of Kiruna and Loussavare are, further, well adapted to the requirements of Thomas process widely employed in Germany and on the Continent.[1]

In addition to these important qualitative advantages, the Scandinavian ores form an important quantitative element in the German supply, as indicated in the following table:

1. The ores from the Lapland fields of Sweden exhibit phosphorus content ranging from 0.021% to 2.06%. It is believed that the bulk of the ore now exported to Germany from those fields is of relatively high phosphours content, perhaps over 1.0%. Traditional technology would regard such ores as suited for handling only by Thomas basic process. It is now believed, however, that recent German refinements permit the use of relatively high phosphorus ores in open hearth furnaces. Norway (and to some extent probably Sweden), along with Spain and Northwest Africa now contribute the low phosphorus ores required in German electric furnaces.

AXIS EUROPE IRON ORE SUPPLY: 1941

Source	Ore	Steel Equivalent[1]
High Grade -	Million Tons	Million Tons
Italy	1.00	0.50
Sweden (exports)	9.00[2]	5.40
Spain	2.00	1.00
North Africa	5.00	2.50
Greece	0.30	0.15
	17.30	9.55
Low and medium grade -		
Germany	25.00	8.00
France	20.00	6.00
Luxembourg	8.00	2.50
Norway	1.50	0.45
Switzerland	0.30	0.08
Poland	0.80	0.25
Hungary	0.40	0.13
	56.00	17.41
Total, all sorts	73.30	26.96

Thus, excluding the Ukraine, Scandinavia appears to control up to 20% of the ore requirements for steel available within the German war economy. Exports reaching Germany are, according to British sources, about 12,000,000 tons per annum, ranging from 60,000 tons in February, 1941, when the routes were ice-bound, to a peak figure of 1,606,000 tons, in September. In addition, of course, Germany receives considerable amounts of Swedish iron in manufactured or semi-manufactured state. The loss of the ore supply would be, both quantitatively and qualitatively,

1. Smelting losses are ignored.

2. Estimated 12 million tons, 1942.

a serious blow to German war industries,[1] involving readjustments in steel manufacturing methods, new capital outlays to rehabilitate sources not used at present, or to expand production from existing sources, and an important additional burden on the Continental transport system.

2. Pyrites. In general, the German position with respect to sulphur is strong. Norway, Italy, Spain, Germany, and Portugal are major pyrites producers; while lesser amounts are normally available in Sweden, Finland, France, Poland, Yugoslavia, and Algeria. The Norwegian deposits, largest on the Continent, are located at Orklatal and Roros, south of Tronkheim, at Sulitjelma south of Narvik, and in the vicinity of Bergen. No information is available as to possible damage caused in the German campaign, although fighting occurred at all of these places. The Swedish output comes from the Boliden mines, in the northern part of the country. It is possible that the loss of the Norwegian supply would involve some reorganization of the German sulphur supply system; although no real shortage is to be anticipated in view of the probable large surplus of pyrites resources in relation to German needs.

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1. A report from Berne, of March 7 (Chicago Daily News), states that the loss of Swedish ore would "amount to a catastrophe in the Nazi war production", since German furnaces have been transformed to use Swedish ore in combination with the inferior supplies available from elsewhere on the Continent. The proportion is stated to be 64% Swedish ore, in some instances. A re-transforming of the German furnaces is regarded as costly in time and efficiency; although it should be remembered that there is no prospect of shortage on the Continent of iron ores, in themselves.

3. Molybdenum. German technology has successfully worked towards a high degree of flexibility in the use of steel-hardening alloys, designed to maximize the total usefulness of the supply of the various alloys available. In the course of the substitutions that have occurred, of the relatively more abundant for the relatively more scarce alloys, molybdenum has taken on an increased importance. In a sample high speed cutting steel, the proportion of molybdenum used has increased from 0.8% to 8.0%, taking the place of tungsten, which was reduced from 20% to 2.0%. Germany's sources of molybdenum in 1940 are given as follows by the Bureau of Mines:[1] (in metric tons)

Norway	600
Rumania	160
Bulgaria	60
Greece	1,600
Italy	40
Morocco	280
	2,740, or 15% of World Production

It is probable that Norwegian production is now fully 2,000 tons, and Finland may contribute an additional 700 tons annually. The loss of these sources, in view of the general tightness of the German alloy position, would be a serious blow. The chief Norwegian molybdenum producer in 1939 was Knaben Molybdangruber; while a new mill was installed by the Laxadalen Molybdangruber, at its property near Gildeskal, in northern Norway. In addition important molybdenum

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1. Recent estimates place current production of molybdenum in Norway, at the Knaben mines, at 900 tons of pure molybdenum sulphide, with 1500 tons in prospect by the spring of 1942. Total production from the whole Scandinavian region for 1942 is expected to be upwards of 2700 tons.

deposits were reported discovered at Lillhard, in Sweden, although there are, as yet, no evidences of production.

4. Tungsten. Portugal is, of course, the principal source of the German tungsten supply; and it is largely by the manipulation of its interests there and in Spain that Germany can hope for an increased supply. Sweden, in 1940, is believed to have produced about 200 tons and Norway about 20 tons of the alloy. The Swedish supply, about 5% of the total produced within the Axis economy probably is used largely in Swedish steel, with Germany receiving some direct benefit through its imports of manufactured steel products. It should be emphasized, however, that the German steel alloy position is so tight that even a small decrease in supply would probably affect a relatively important segment of hard steel production.

5. Nickel. More than a third of the nickel resources known to be under German control came from Norway in 1940: (in metric tons)

Norway	1,250
Greece	1,300
Germany and Austria	600
Italy	200
	3,350

This figure excludes the production forthcoming from Finland's mine at Petsamo. Late in 1940 Finnish officials announced that no production was taking place, while American observers concurred that there was no reason to believe that Germany was receiving any ore from this source. The mine

itself was thought not ready to produce until the latter months of 1941, while the completion of the matte refinery was expected to be delayed still further. Advices late in 1941 and in January 1942 indicate, however, that some 3,000 men are now working the mine, that German technicians have speeded the expansion of operations, and that ore is going to Sweden at a rate of 10,000 tons per annum. A British source states, further, that by March 1942 at least one of the refinery furnaces at Petsamo was operating, sending an unspecified quantity of copper-nickel matte to an I. G. Farbenindustrie plant in Germany. It is the conclusion of the International Nickel Company that Finnish ore and matte exports to Germany amounted to 5,000 tons, metal content, in 1941, and may reach fully 10,000 tons in 1942. Norwegian nickel is produced at the refinery of Kristiansand, which had, until the German occupation, been owned by the Falconbridge Nickel Mines, Ltd. Production is believed to have fallen sharply, at first, but German technicians have probably taken over successfully.

6. Copper. Each of the Scandinavian countries is a small copper producer. In 1940 it is estimated, however, that their total output of 43,000 tons (metal content of ore) constituted about 29% of total production under German control. That production (149,400 tons) is believed seriously inadequate for German needs, even under conditions of rigid economy and extensive substitution. It is generally agreed that the German copper stockpile is being drawn down; and that dependence may have to be placed on current production alone, by the close of 1942 or early in 1943. A denial

to the Germans of the Scandinavian sources would obviously tend to hasten the reduction of the German copper stockpile.

It is clear that the total output of the Norwegian mines (20,000 tons, m. c.) is under German control. It is, further, reported that the principal mine, at Roros has been expanded. In December 1940 expansion plans were announced also for the Swedish ore fields in the province of Vasterbotten. Normal Swedish exports of copper, largely manufactured and semi-manufactured products, amounted (1938-39) to somewhat over 11,000 tons. This output, probably expanded, is surely going to Germany. Finnish production, as well, appears to have been expanded. The Bureau of Mines reports that the principal copper producer of Finland, the Outokumpa Copper Company, laid plans to erect a concentration plant at Makola in the Nevala district, which was to go into operation in the summer of 1941. This new development is calculated to yield 45,000 tons of ore, 9,100 tons of metal. It is probable that the maximum surplus of copper, above minimum Finnish requirements, is going, at present, to Germany. Pre-war exports of 13,000 tons of raw copper (1938) are probably being exceeded.

7. Aluminum. There is, essentially, no shortage of the raw materials or of the manufacturing facilities for aluminum in the area under German control. Germany itself, Hungary, and France offer immense supplies of bauxite. The potentialities of Norwegian hydro-electric power, nevertheless, are undoubtedly attractive to German planners who must move enormous coal supplies over the attenuated Continental

transport system.[1]

The figure of 15,000 tons is offered as Norwegian aluminum production in 1940, less than 5% of total production under Axis control: normal (e.g., 1938) production stood at about twice that figure.

In the course of 1941 (August) elaborate plans were reported for expanding Norwegian production to fully 175,000 tons. There have been subsequent reports of specific new developments at Aukre, Sogne Fjord,[2] Glem Fjord, and Aublad. It is believed that the new plants will rely heavily on labradorite, a domestic stone which yields aluminum (30-35% aluminum oxide) rather than imported alumina or bauxite. There is no evidence that any new plants are as yet completed or producing. A British report of September 1941 indicated that German failure to deliver adequate supplies of alumina was holding up the projected expansion of output from existing facilities. The principal aluminum plant in Norway, at Hoyanger, believed normally to employ Italian bauxite, was reported bombed in April 1941.[3] Damage is not specified.

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1. The probable surplus of electric power in Norway is of potential value to the Germans not only in the production of aluminum, but also in the manufacture of calcium carbite, the material from which synthetic rubber is largely derived in Germany. It is likely that the extension of the war has forced a major expansion of the manufacture of German synthetic rubber and a recent report, from Standard Oil of New Jersey, suggests that the Novsk-Hydro power trust, long associated with I. G. Farben-industrie, may cooperate in this expansion.

2. This report probably refers to an expansion of the Hoyanger Plant.

3. The source of bauxite employed at Hoyanger is variously reported as Hungry, Greece, and Italy.

In net, then, Norway can be counted upon to notice between 5% and 10% (20-50,000 tons) of total German aluminum supplies, although a much larger output is technically feasible. A denial of the area to Germany would have the effect of cutting not only into current supplies, but also of defeating possible plans for large-scale extension of the German light-metal supply.

The role of the Scandinavian area in the German war economy, with respect to minerals, can be summarized roughly as follows:

Commodity	Percentage of Total Axis Supply in Scandinavia (1942)
Iron Ore	19
Pyrites	38
Molybdenum	73
Tungsten	6
Nickel	78
Copper	39
Aluminum	5 - 10
Zinc	9

The loss of these resources would, patently, constitute a serious blow to the German war effort, even in those cases, such as iron ore, where alternative sources could, in time, be developed.

III. Timber and Associated Products

For its supplies of timber, paper, and wood pulp Germany is overwhelmingly dependent on the considerable volume of exports that the Scandinavian countries normally produce. That surplus was, in pre-war years, sufficient to supply the natural deficiency of Britain, the Continent, and in some products, of the United States (e.g., newsprint). Germany's demands for these materials, normally large, has been much expanded. Cellulose is an important element in the manufacture of explosives; and, as well, it serves in the manufacture of substitute textiles and substitute

fodder. The Scandinavian industry, long developed on export lines, is patently the most important source available for this range of products which includes wood pulp (mechanical, sulphate, and sulphite), newsprint, wrapping, writing, and cigarette paper, cardboard, and timber (logs, pit props, planks, laths, etc.). In 1938 these items accounted for roughly 35% of the value of the exports of Sweden;[1] 21%, of Norway, and fully 78%, of Finland.

Although timber, paper, and wood pulp are not usually regarded as of such direct strategic significance as the principal minerals, the loss of the Scandinavian sources of these products might have an even greater immediate effect than the loss of the Scandinavian minerals (excepting Swedish iron ore), since so large a proportion of the German supply is, at present, drawn from this region. Adequate alternative sources, economies, or substitutions could not easily be organized.

IV. Foodstuffs

At the present time Finland is a deficit food area, drawing some imports from Sweden and from the Reich, largely bread grains. Sweden is, relatively, a slight surplus area, with the standard of food consumption well maintained, despite rationing. The weakest element in the Swedish position is the shortage of fodder. Norway is suffering some food shortages, especially in urban areas, due largely to German confiscations of fish, milk, and potatoes. The German authorities may have created, and have certainly exploited these shortages, so that increased food allowances might be used as a lever against the considerable dissident groups within

1. A report of March 25, 1942, states that, by agreement, Germany will receive timber, paper, and wood pulps from Sweden to the value of 70-75 kronor in the first half of 1942.

the Norwegian population. Norway normally exports fish on a considerable scale (about 12% of value of total exports, 1938); but fish shortages have recently been reported at Bergen. The Germans are believed to have taken some 500 million pounds of fish from Norway in 1941, as well as larger amounts of roe, fish meal, cod-liver oil, and other fish products. Sweden exported, in pre-war years, considerable amounts of pork and butter: in 1938, 13,002 tons of the former, 28,555 tons of the latter. On the whole, however, despite the importance of the Norwegian fish supply, the loss by Germany of its monopolistic position in Scandinavia would not have any very serious repercussions on her food position; and some 200,000 tons of sugar and 300,000 tons of bread grains, believed imported from the continent to Scandinavia in 1941, would be available for distribution elsewhere.

V. Shipbuilding

The rated capacity of Norwegian and Swedish shipyards is 100,000 and 275,000 gross tons, respectively; or 15% of the total capacity of German-controlled Europe. In 1941, however, it is estimated that Norway produced 40,000 tons, in vessels over 100 tons, while Sweden completed 145,000 tons. This amounted to fully 26% of the estimated tonnage turned out from Axis shipyards. Norwegian yards are, of course, completely under German control. A recent (January 17, 1942) issue of the Foreign Commerce Weekly states that "at least 50 new ships are under construction in Norway" for German account. Shipbuilding has now been given a high priority in the allocation of the labor supply, and Norwegian production in 1942 may be as high as 50,000 tons.

A 1942 agreement between Germany and Sweden is reported to involve the delivery of more than 30,000 tons in merchant shipping to Germany in

the coming year. Germany is required to furnish considerable amounts of steel for the building of these vessels. Even without the transfer of new or old ships to the German flag, however, Swedish vessels are exceedingly important to the German economy, bearing a considerable part of the burden of the Baltic trade.

The denial to Germany of the shipyards of Sweden and Norway, would, under present circumstances, constitute a serious loss; although there are, patently, other shipyards which have thus far remained idle, which might substitute for them. Over a period of time the loss of trained Scandinavian personnel might prove of greater significance than the denial of the shipping ways themselves.

VI. Industrial Production

The full importance of the Scandinavian region to the German war economy can not be measured in terms of raw materials alone. Germany is, above all, short of trained industrial personnel. Sweden especially is in a position to export to Germany types of manufactured goods which effect important savings in scarce labor. Sweden's normal pre-occupation with the production of machinery and high grade steels make her manufactured exports of special significance under war-time conditions. In the case of wood products, aluminum, and shipbuilding Scandinavia's contribution to the relief of the German skilled labor shortage has already been taken into account.

In 1938, about 9% of the value of Sweden's exports consisted of semi-manufactured goods, in the form of ferro-alloys, iron ingots, wire,

strips, and copper bars, sheets, etc.; 13% consisted of tools, engines, machinery, motors, etc. No adequate data are available as to the constitution of the present flow of Sweden's exports to Germany; but it seems reasonable to suppose that considerable amounts of these semi-manufactured and manufactured materials are now going to the Continental war machine. Germany's willingness to export an estimated 3.2 million tons of coal, 1.6 million tons of coke, 810,000 tons of commercial and coke pig iron to Sweden in 1941 can be taken as a measure of the importance of the industrial services now being rendered.

While a denial of the Scandinavian area to Germany would effect certain savings in the form of coal, pig iron, and other goods now being exported from the Continent, there can be little doubt that a considerable net economic loss to Germany would result, at points where the German war economy is highly vulnerable. Thus, although the net contribution of Scandinavia to the German national income may, in monetary terms, be relatively small, the strategic quality of the commodities it now contributes to the German war effort makes it an area of extreme importance.